
# RemoveDebris mission, from concept to orbit

Guglielmo S. Aglietti*

Surrey Space Centre (University of Surrey)
*g.aglietti@surrey.ac.uk

## Abstract

The RemoveDebris mission is going to be the first European Active Debris Removal (ADR) missions to give an in orbit demonstration of the viability of a series of cost effective technologies that can be used to observe, capture and destroy space debris.

The craft has been shipped out to the Kennedy Space Center and it is scheduled for launch to the ISS on the 2nd of April 2018, on board a Dragon capsule (SpaceX CRS-14 ISS re-supply mission). From here the satellite is going to be deployed via the NanoRacks Kaber system into an orbit of around 400 km.

The mission concept consists of a main mini satellite platform of approximately 100kg mass that once in orbit will release two 2U cubesats which will act as space debris. Four key technologies, to be used at different stages of a typical ADR mission will be tested: Vision Based Navigation (VBN) as a tool to observe and quantify the relative dynamics between an uncooperative debris and the platform preparing for its retrieval, two technologies for debris capture, namely a net and a harpoon, and finally a de-orbit sail, to increase the satellite platform drag, thus reducing its speed and orbit altitude until it burns into the Earths atmosphere.

More in detail, one of the cubesats, after low speed ejection from the satellite platform will be observed using the VBN to prove its hardware and algorithm. The second cubesat, after ejection, will inflate a structure to increase its size to make it comparable to that of larger debris becoming a more size-representative target for the net capture experiment i.e. a net will be launched by the platform to envelope and capture the cubesat. A small panel of HB material analogous to that used in standard satellites construction will then be deployed using a boom that will position this panel at a 1.5 meter distance from the platform. This panel will be the target for the harpoon experiment (i.e. a tethered harpoon is going to be fired by the satellite platform to hit this panel). The last experiment to be performed will be the drag sail. During a real mission this would be the last phase, when the platform and the debris that it has captured are deorbited together, destroying them burning into the atmosphere.

This paper examines the design of the mission from initial concepts through to manufacture, AIT, testing and up to launch, and apart from a general consideration of the mission, will focus on the elements of design & testing that differ from a conventional mission.

The RemoveDebris mission is a significant contribution to achieving the ultimate goal of a cleaner Earth orbital environment, and a stepping stone toward commercial exploitation.

G S. Aglietti, B Taylor, S Fellowes, S. Ainley, T. Salmon, I Retat, M. Roe, C. Burgess d, T. Chabot, A. Pisseloup, A. Phipps, C. Bernal, F. Chaumette, A. Pollini, W. Steyn

This project is supported by the European Commission FP7-SPACE-2013-1 (project 607099) 'RemoveDebris – A Low Cost Active Debris Removal Demonstration Mission', a consortium partnership project consisting of: Surrey Space Centre (University of Surrey), SSTL, Airbus GmbH, Airbus SAS, Airbus Ltd, Ariane Group, Innovative Solutions in Space (ISIS), CSEM, Inria, Stellenbosch University.